## CLAIMS

1. An electronically tuned radio-frequency power amplifier, comprising: (a) a power amplifier having an amplifier input and an intermediate output, and (b) an output network coupled to said intermediate output of said power amplifier, said output network including a tuning input, a network output, and at least two reactive components connected as a tuned circuit, at least one of said at least two reactive components being adapted to being electronically tuned by a tuning signal applied to said tuning input.

2. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said output network is adapted to be tuned to a selected frequency.

3. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said output network is adapted to be adjusted to match a selected load impedance.

4. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said output network is adapted to produce a modulated signal at the network output.

5. An electronically tuned radio-frequency power amplifier as in claim 4, wherein said output network is further adapted to provide a power-amplifier load-impedance locus that substantially maximizes power-amplifier efficiency.

6. An electronically tuned radio-frequency power amplifier as in claim 4, wherein said output network is further adapted to follow a substantially resistive power-amplifier impedance locus, thereby maintaining power-amplifier efficiency near maximum.

7. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said output network is adapted to be tuned in accordance with a predetermined set of tuning inputs.

8. An electronically tuned radio-frequency power amplifier as in claim 7, wherein said tuning inputs are selected in accordance with a lookup table.

9. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said output network is adapted to be tuned in accordance with a predetermined lookup table of tuning inputs.

10. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said output network is adapted to be tuned in accordance with a sample of the amplifier output.

11. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said output network is adapted to be tuned in accordance with a sample of the network output.

12. An electronically tuned radio-frequency power amplifier as in claim 1,

wherein said output network is adapted to be tuned in accordance with a sample of a radiated signal.

13. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said at least two reactive components include at least one capacitive component adapted to be electronically tuned in capacitance.

14. An electronically tuned radio-frequency power amplifier as in claim 13, wherein said at least one capacitive component includes a transistor.

15. An electronically tuned radio-frequency power amplifier as in claim 13, wherein said at least one capacitive component includes a diode.

16. An electronically tuned radio-frequency power amplifier as in claim 13, wherein said at least one capacitive component includes a diode having a control terminal.

17. An electronically tuned radio-frequency power amplifier as in claim 13, wherein said at least one capacitive component includes a micro electro-mechanical system device.

18. An electronically tuned radio-frequency power amplifier as in claim 13, wherein said at least one capacitive component includes a variable-dielectric material.

19. An electronically tuned radio-frequency power amplifier as in claim 13, wherein said at least one capacitive component includes a piezo-electric

device.

20. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said at least two reactive components include at least one inductive component adapted to be electronically tuned in inductance.

21. An electronically tuned radio-frequency power amplifier as in claim 20, wherein said at least one inductive component includes a variable-permeability core.

22. An electronically tuned radio-frequency power amplifier as in claim 20, wherein said at least one inductive component includes a piezo-electric device.

23. An electronically tuned radio-frequency power amplifier as in claim 1, wherein said at least two reactive components include at least one transmission line adapted to be electronically tuned in electrical characteristics.

24. An electronically tuned radio-frequency power amplifier as in claim 23, wherein said at least one transmission-line component includes an electrically variable dielectric material.

25. An electronically tuned radio-frequency power amplifier as in claim 23, wherein said at least one transmission-line component includes an electrically variable magnetic material.

26. An electronically tuned radio-frequency power amplifier as in claim 1, further comprising a passive filter coupled to said output network for removing undesired harmonic frequencies.

27. An electronically tuned radio-frequency power amplifier as in claim 1, further comprising a second electronically tuned filter coupled to the amplifier input of said amplifier for tuning the amplifier input.

28. An electronically tuned radio-frequency power amplifier as in claim 1, further comprising a controller with a controller input and controller output, said controller providing conversion of frequency, impedance, and modulation inputs into tuning signals for control of said electronically tuned network.

29. An electronically tuned radio-frequency power amplifier as in claim 28, further comprising an envelope detector with an envelope-detector input and envelope-detector output, said envelope-detector output coupled to the input of said controller, said envelope detector being responsive to an input RF signal and providing a modulation input to said controller.

30. An electronically tuned radio-frequency power amplifier as in claim 28, further comprising a drive-level adjustor with an adjustor input and adjustor output, said adjustor output coupled to the input of said RF power amplifier, said adjustor being responsive to an input RF signal and providing an RF-drive signal to the input of said RF power amplifier.

31. An electronically tuned radio-frequency power amplifier as in claim 28, further comprising a digital signal processor with digital-signal processor outputs coupled to the inputs of said RF power amplifier and said controller, said digital signal processor generating the RF-drive signal to the RF power amplifier and modulation input to the controller.

32. An electronically tuned radio-frequency power amplifier as in claim 28, further comprising a digital signal processor with digital-signal processor outputs coupled to the inputs of said RF power amplifier and said electronically tuned network, said digital signal processor generating the RF-drive signal to the RF power amplifier and the tuning signals to the electronically tuned network.

33. An electronically tuned radio-frequency power amplifier as in claim 1, further comprising a drive-level adjustor for adjustment of the amplitude of the RF-drive input to said RF power amplifier.

34. An electronically tuned radio-frequency power amplifier as in claim 33, wherein said output network and said RF-drive amplitude are adapted to produce a modulated signal at the network output.

35. An electronically tuned radio-frequency power amplifier as in claim 34, wherein said output network and said RF-drive amplitude are further adapted so that the drive amplitude determines the amplitude of the network-output signal when the amplitude of said network-output signal is below a threshold, and said output network determines the amplitude of the network-output signal when the amplitude of said network-output

signal is above a threshold.

36. An electronically tuned radio-frequency power amplifier as in claim 33, further comprising a controller for a converting modulation input into tuning signals for control of said electronically tuned network.

37. An electronically tuned radio-frequency power amplifier as in claim 1, further comprising a bias input for setting the bias level of said power amplifier.

38. An electronically tuned radio-frequency power amplifier as in claim 37, wherein said bias is adapted to the minimum level necessary to enable operation of the power amplifier, thereby reducing power consumption.

39. An electronically tuned radio-frequency power amplifier as in claim 37, further comprising a controller for adjusting said power-amplifier bias in response to frequency, impedance, and modulation inputs.

40. An electronically tuned radio-frequency power amplifier, comprising:
(a) means for amplifying power, said power-amplifying means having an amplifier input and an intermediate output, and
(b) means coupled to said intermediate output and adapted for electronic tuning of said radio-frequency power amplifier for providing a tuned output.

41. An electronically tuned radio-frequency power amplifier as in claim 40, said power amplifier operating in class E and said electronic-tuning

means adapted to provide the series and shunt reactances for optimum class-E operation for a selected frequency.

42. An electronically tuned radio-frequency power amplifier as in claim 40, said power amplifier operating in class E and said electronic-tuning means adapted to provide the series and shunt reactances for optimum class-E operation while delivering power to a selected load impedance.

43. An electronically tuned radio-frequency power amplifier as in claim 40, said power amplifier operating in class E and said electronic-tuning means adapted to provide the series and shunt reactances for optimum class-E operation while simultaneously modulating the output of said electronic-tuning means.

44. An electronically tuned radio-frequency power amplifier as in claim 40, said power amplifier operating in class E and said further incorporating one or more fixed tuning elements for optimum class-E operation at a first frequency, said electronic-tuning means adapted to provide the amplifier load impedance for optimum class-E operation for a selected second frequency.

45. An electronically tuned radio-frequency power amplifier as in claim 40, said power amplifier operating in class E and said further incorporating one or more fixed tuning elements for optimum class-E operation at a first network-output load impedance, said electronic-tuning means adapted to provide the amplifier load impedance for optimum class-E operation for a selected second network-output load impedance.

46. An electronically tuned radio-frequency power amplifier as in claim 40, said power amplifier operating in class E and said further incorporating one or more fixed tuning elements for optimum class-E operation at full output amplitude, said electronic-tuning means adapted to provide the amplifier load impedance for efficient suboptimum class-E operation while simultaneously amplitude-modulating the signal at the network output.

47. An electronically tuned radio-frequency power amplifier system, comprising a plurality of amplifier subsystems and a power combiner with a plurality of inputs, each amplifier subsystem comprising
(a) a power amplifier having an amplifier input and an intermediate output, and (b) an output network coupled to said intermediate output of said power amplifier, said output network including a tuning input, a network output, and at least one reactive component being adapted to being electronically tuned by a tuning signal applied to said tuning input;
the network outputs of each subsystem being coupled to inputs of the power combiner for delivery of signals from all power amplifiers to a common load.

48. An electronically tuned radio-frequency power amplifier system as in claim 47, wherein said output networks are adapted to be tuned to selected frequencies.

49. An electronically tuned radio-frequency power amplifier system as in claim 47, wherein said output networks are adapted to be tuned to match

desired load impedances.

50. An electronically tuned radio-frequency power amplifier system as in claim 47, wherein said output networks are adapted to modulate the signals from the power amplifiers.

51. An electronically tuned radio-frequency power amplifier system as in claim 47, wherein said output networks are adapted to cancel reactances resulting from the combining of the plurality of signals.

52. An electronically tuned radio-frequency power amplifier system as in claim 47, further comprising a controller with a controller input and controller outputs for each subsystem, said controller generating RF-drive and control signals for each subsystem.

53. An electronically tuned radio-frequency power amplifier system as in claim 52, wherein said controller is adapted to generating RF drive signals of different phases for production of an amplitude-modulated system output.

54. An electronically tuned radio-frequency power amplifier system as in claim 52, wherein said output networks are adapted to cancel the reactances resulting from combining out-of-phase signals, thereby improving efficiency and other operating characteristics of the power amplifiers.

55. An electronically tuned radio-frequency power amplifier as in claim 47,

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